scientific reports

Check for updates

OPEN

Retrieval processes, phenomenology, and importance for self-identity of unique vs. repeated events in autobiographical memory

Ioanna Markostamou[1,3]✉, Annick F. N. Tanguay[2] & Lia Kvavilashvili[3]

Studies on autobiographical memory (AM) have primarily focused on unique or specific events that had happened at a particular time and place and did not last longer than 24 h. Very little is known about AMs of repeated or general events despite their prevalence and potential importance for self-identity. To address this gap in the literature, 60 participants completed a within-subjects experiment where they recalled 1880 AMs of unique and repeated events from the recent and distant past, and rated AMs on retrieval and phenomenological characteristics, and importance for self-identity and lifetime periods. Results revealed shorter retrieval latencies, lower retrieval effort ratings, and higher prevalence of direct retrieval for AMs of repeated events compared to unique events. Moreover, repeated events were rated as more important for self-identity and for defining lifetime periods. Although the phenomenological memory characteristics of unique and repeated events were similar, unique events were rated as more emotionally positive while repeated events had been more frequently rehearsed. Theoretical and practical implications of the findings are discussed primarily with respect to AM accessibility and retrieval accounts as well as how different types of events contribute to the conceptual self.

Keywords Autobiographical memory, Retrieval processes, Phenomenology, Repeated events, Unique events

Autobiographical memory is the memory for personally experienced past events and plays an essential role in developing and maintaining a sense of self and identity[1]. Studies on autobiographical memory have primarily focused on unique (i.e., specific, one-off) events (e.g., *My brother and I baking a cake for our parents' 20-year anniversary*), or events that are particularly personally-significant (emotional, traumatic, and life-changing), unusual, or easily-accessible (i.e., recent) events[2]. However, such pivotal unique events are relatively rare personal experiences, and thus are typically experienced less frequently across different lifetime periods[3]. In fact, a large proportion of the content of autobiographical memories concerns repeated (i.e., categorical) events (e.g., *I walked my dog every morning in Green Park when I lived in London*; *We would always have a coffee and cake morning break together with colleagues every other week*[4]. For example, when in a landmark study by Barsalou[4], undergraduate students were stopped on campus and asked to recall events that happened to them during their last summer holiday, a large proportion of recalled events referred to repeated and extended events (only 21% of recalled events were specific). In line with these findings, laboratory studies of involuntary autobiographical memories, whereby participants complete a monotonous and non-demanding vigilance task while being exposed to incidental verbal cue phrases[5], have found that 20–40% of reported involuntary memories were about more general events (i.e., extended events or repeated events) and not just unique events[6,7]. Similarly, studies employing word-cue paradigms to sample voluntary autobiographical memories without imposing any temporal or specificity memory restrictions (i.e., whereby participants are asked to report any autobiographical memory they recall in response to the word-cues they are presented) have also found that participants retrieve both unique (specific) and repeated (categorical) events (e.g.[5,7–10]).

[1]School of Psychology, Bournemouth University, P123, Talbot Campus, Fern Barrow, Poole BH12 5BB, UK. [2]School of Psychology, University of Ottawa, Ottawa, Canada. [3]School of Life and Medical Sciences, University of Hertfordshire, Hatfield, UK. ✉email: imarkostamou@bournemouth.ac.uk

Some past investigations have focused on the neural correlates of recalling general events (i.e., repeated and extended events) in comparison to unique events[11,12]. In those studies, participants had to press a button when a cue, a word or music, had triggered the recall of an event, and then participants pursued with an elaboration phase to retrieve the details of the event[11,12]. The response time to identifying (or "constructing") the event was similar between general and unique events in one study[12], and approximately two seconds faster for unique than general events in the other[11]. Conversely, neural activity had peaked ~ 4 s earlier for general events than unique events in a functional magnetic resonance study (fMRI;[13]). Additional key findings indicate that general and unique events share notable overlap in neural activity during the early phase of retrieval, including in regions typically associated with episodic memory like the hippocampus, medial prefrontal cortex, and posterior cingulate[14], but with greater activity for unique than general events in several regions[11–13,15]. Nonetheless, in those studies, events were categorized as general (i.e., repeated and extended) or unique (i.e., one-off specific) after participants had recalled memories in response to cues; consequently, the retrieval processes are less clear for the intentional recall of repeated events.

Whilst past research on declarative memory has focused on where repeated-event memories fall on the semantic-episodic continuum[12,15–18], behavioural studies on AM have often shied away from including repeated events as valid AM responses from their participants. In fact, a large proportion of AM studies employing word-cue paradigms have imposed specificity restrictions to their participants by instructing them to recall only specific, one-off events that had occurred at a particular time and place and lasted less than 24 h (e.g,[19,20]). Prompting for specific memories of unique events has also been particularly dominant in research with clinical populations, such as individuals with depression, as a way of assessing over-general autobiographical memory[21]. However, imposing such specificity instructions, particularly in typical populations, may disrupt their natural retrieval processes by engaging strategic search and executive monitoring processes, often forcing a response that matches the task specificity requirements even if it was not the individual's initially retrieved AM[9,10].

Beyond specificity, AMs can vary with respect to qualitative characteristics, such as vividness or emotionality. Compared to unique events, repeated events have been previously found to be generally remembered less vividly[11,12,14,15,22,23] and associated with lower ratings of personal significance[14,15] and emotional intensity[12,14,22]. However, one recent study found that the vividness, visual details, and personal relevance of repeated events ranged midway between "moderately" and "very/a lot" on average[16]. In fact, healthy adults recall a similar number of details from repeated events compared to unique events (e.g.[23]), especially when considering details across all instances of the repeated events[24].

On the other hand, memory for repeated events appears to be similar to memory for unique events in several ways - both usually contain rich visual imagery[25] and contextual information, often from a first-person perspective[26]. In fact, several studies point to a close proximity between repeated events and unique events, relative to decontextualized general or personal facts, for example[15,17,27]. A key driver of proximity between repeated events and unique events may be their common anchoring in space[15], in accordance with their characterization as "event memory"[28], and the pivotal role of space in episodic memory[29].

Repeated events can be central to the formation of personal schemata based on representations of the common characteristics of separate but similar events[30]. While highly specific and unique episodes (e.g., graduating) have been found to be strongly tied to constructing identity and guiding future behaviour, recurring events, particularly events taking place over longer lifetime periods (e.g., university years), are also important for representing the development of close social relationships over time[31], reflecting a more dynamic contribution towards shaping one's life story. Interestingly, in a study investigating how young adults valued their childhood memories, AMs of unique and repeated events were found to hold equivalent personal meaning and comparable biographical importance[23].

Repeated events also play an important role in autobiographical memory retrieval, particularly to access unique episodes[1]. According to Conway's Self-Memory System model, the contents of autobiographical memory are organised hierarchically in various levels of abstraction (life story, lifetime periods, general [repeated] events, specific events;[1,26]). As such, different types of autobiographical memory representations can be formed, processed, and retrieved by disparate component systems (e.g., perceptual details, conceptualized information;[1,4,26,32,33]).

Conway and Pleydell-Pearce's model[26] also describes two principal modes in which autobiographical memories can be accessed and retrieved. Generative retrieval involves an active, top-down, and effortful search process starting at the top of the hierarchy to retrieve a memory. By contrast, direct retrieval relies on bottom-up associative retrieval mechanisms that do not involve active search processes, with the autobiographical event arising into awareness quickly and effortlessly. While generative, effortful retrieval was regarded as the primary process through which AMs are retrieved[26], accumulating empirical evidence from cueing paradigms suggests that AMs are often retrieved directly (50–70% prevalence), with fast retrieval latencies and low subjective effort ratings[8,10,19,20,34]. These empirical findings challenge the idea that AM retrieval is predominantly generative and effortful, and instead highlight the dominance of automatic associative retrieval processes, in line with recent theoretical accounts[35,36]. Furthermore, these findings, along with priming evidence[37], provide support to the notion that autobiographical contents are typically highly accessible and ready to be activated by an appropriate cue, requiring minimum strategic search operations.

The present study

Despite their importance, autobiographical memories of repeated events have been studied little and rarely compared to memories of unique events. Thus, the main objectives of the present study were to examine the retrieval processes as well as the perceived importance and phenomenological properties of autobiographical memories of repeated events and directly compare them to autobiographical memories of unique events. While the retrieval processes of unique events have been extensively studied[34,38], fewer studies have investigated the

retrieval processes of repeated events. Nevertheless, we anticipated repeated events to be more accessible than unique events, in line with Conway's hierarchical model of AM[1,26]. Thus, we expected memories of repeated events to be retrieved faster and more effortlessly compared to unique events, and with a higher prevalence of direct retrieval. This hypothesis would also be in line with certain fMRI findings showing shorter latencies for retrieving memories of general events compared to specific events[13], although other studies have reported similar retrieval latencies between the two event types (e.g.[12], or even shorter latencies for unique compared to general events[11].

Despite several studies suggesting certain similarities and distinctions in phenomenological experiences, it is unclear how these link to retrieval processes and the importance of events for one's identity or for certain life periods. At first thought, the routine or recurrent nature of repeated events might make them appear less self-important or salient than a unique event, as perhaps hinted to in the findings reviewed above. However, we expected repeated-event AMs to be rated as more important for self-identity and for defining lifetime periods, given their role in abstraction and the formation of personal schemata[30]. Indeed, personal semantics are frequently produced to elaborate on an important facet of identity[39] and play a pivotal role in forming self-representations from the distant past[40].

To summarise, in the present study we systematically examined potential similarities and differences between AMs of unique and repeated events by directly comparing their retrieval characteristics (i.e., prevalence of direct retrieval versus generative retrieval, retrieval latencies, and self-perceived retrieval effort), perceived importance for self-identity and for characterising lifetime periods, as well as their phenomenological properties (including emotional valence, vividness and visual perspective, rehearsal frequency). To that end, we employed a word-cue paradigm[10] to sample autobiographical memories of unique and repeated events that had occurred either recently or in the distant past. The manipulation of the temporal distance of the AM events from the present moment allowed us to examine and compare the self-perceived importance of the two types of events for self-identity as well as for discrete life-time periods, resulting in a more comprehensive understanding of their contribution towards building the autobiographical knowledge base. It also enabled us to control for and thus minimise well-established temporal distance effects in AM (e.g.[41], including the fact that recent events tend to be more accessible and have higher phenomenological richness (like vividness) than remote events (e.g.[42]).

Method

Study design

For this study, we employed a 2 · 2 within-subjects design, with Type of Event (unique vs. repeated autobiographical events) and Temporal Distance (distant vs. recent past) as the independent variables. The dependent variables included the retrieval characteristics of AMs (i.e., prevalence of direct retrieval versus generative retrieval, retrieval latencies, and self-perceived retrieval effort), their phenomenological characteristics (i.e., emotional valence, vividness and visual perspective, rehearsal frequency), and their importance ratings for self-identity and for characterising lifetime periods.

Participants

A total of 64 participants were recruited and tested for this study. The study was approved by the Health, Science, Engineering & Technology Ethics Committee with Delegated Authority of the University of Hertfordshire and conducted in accordance with the 2013 Declaration of Helsinki. All participants participated voluntarily and provided informed consent prior to data collection. Participants were recruited through online participant databases of the university, invitation leaflets, social media platforms, and word of mouth. Four participants were excluded because they either did not complete the whole experiment (two participants) or had an active neuropsychiatric condition that could affect cognitive functioning (two participants). This resulted in a final sample of 60 participants (52 female) who were all English-speaking (including non-native fluent and native speakers) and aged between 18 and 54 years ($M = 25.25$, $SD = 8.03$). To determine the sample size, we ran an a-priori power analysis using G*Power[43] with a power of 0.8, an alpha level of 0.05, 2 groups, 4 measurements, a 0.5 correlation between repeated measures (default), and a nonsphericity correction of 1 (default) for the estimation, which indicated that a sample of 56 participants would be required to obtain a conservative effect size (Cohen's $f = 0.16$).

Materials and measures

Materials

We used a standard word-cue paradigm adapted from[10], whereby concrete words taken from cluster eight of the Toglia and Battig semantic word norms[44] were used as cues for eliciting retrieval of autobiographical memories. All 32 word-cues were nouns with high ratings of concreteness, imagery, and familiarity, with valence ratings ranging from neutral to positive (see Table A1 of the Appendix for the word-cues used and their psycholinguistic characteristics). We used word-cues with these characteristics because they have been found to produce reliable results[10] and be more effective at eliciting successful retrieval of AMs compared to abstract words, particularly direct retrieval[19,34]. Future studies should also examine how other cue types, like visual cues (e.g.[45]), might influence the retrieval and phenomenology of memories for unique and repeated events.

Procedure and measures

Participants were tested individually in a single online session (via Zoom) that lasted approximately 90–120 min. Participants provided background and demographic information at the outset of the testing session before completing the experimental autobiographical memory task. Before starting the AM task, the nature of AMs was explained to participants (i.e., recalling memories of personally experienced events from their past). Participants were also given explanations of the word-cue task (i.e., think of a memory that would involve or be related to

each word-cue they would see) along with some representative examples (e.g., with the word-cue "table", *"Sitting around a large table with family last Christmas"*).

It was further explained to participants that the word-cue task consisted of different parts involving the recall of memories of unique events (i.e., memories of a specific, one-off event that they had experienced in the past – for example, *"I visited my parents for dinner last Sunday"* or *"I broke a lamp while playing with my dog, Meg, when I was a kid"*) and repeated events (i.e., memories of separate but similar or recurring events they had personally experienced in the past – for example, *"Last month, I visited my parents for dinner every Sunday"* or *"My dog would always come at the front door to welcome me when I returned home from school"*), respectively.

Subsequently, across four experimental blocks, participants were asked to recall either unique or repeated autobiographical events that had occurred recently (over the last 12 months) or during their childhood years (between 10 and 15 years of age). To avoid any order or carry-over effects, the four experimental blocks were administered following a Latin Square design, whereby each participant was randomly assigned to start with recalling memories from the distant or recent past. Within each lifetime period block, each participant was randomly assigned to start with unique or repeated events. There were 8 trials within each experimental condition (i.e., 32 trials in total), which were administered in a random order.

In each experimental condition, participants were instructed to recall an AM as quickly as possible in response to each word-cue presented. As soon as they retrieved a memory, participants had to say *"okay"*, and then respond to questions regarding the retrieval characteristics of each memory recalled, provide a brief description of their memory, rate it on several qualitative memory characteristics, as well as on the importance of each event for the self and life-time period, before moving to the next trial. Each question along with the response options were read by the experimenter while at the same time they were also presented to the participants on the computer screen. Participants' responses were audio recorded and transcribed verbatim.

Retrieval characteristics

The experimenter recorded retrieval latencies (in msec) from the moment the word-cue was presented until the participant said *"okay"*, with a stopwatch. If no memory was retrieved within 60 s, the next word-cue was presented.

To examine the rates of direct and generative retrieval, participants then answered the question *"How did you recall the memory"* by choosing one of two response options: (a) *"It just popped into my mind by itself"* (suggesting a direct retrieval process), and (b) *"I had to actively search to find the memory"* (suggesting a generative retrieval). A third (c) *"I don't know"* option was also provided, which was selected in approximately 2.5% of the trials.

To assess the subjective retrieval effort for each AM, participants also rated how easy or difficult was it was to recall the memory on a bipolar 5-point scale (1 = *very easy*, *I was not trying at all*, to 5 = *very difficult*, *I put a lot of effort*), indicating the absence or presence of retrieval effort, respectively.

Qualitative characteristics of memories

Next, participants provided a brief description of the memory, which was recorded with a voice recorder and later transcribed verbatim. To evaluate the phenomenology of recalling the different autobiographical event types, participants rated several qualitative characteristics of each AM retrieved. These included the following measures: (a) the visual imagery vividness of the memory (1 = *very vague* to 5 = *very vivid*, *almost like seeing it*); (b) the visual perspective, including seeing the event through their own eyes (i.e., first-person visual perspective; 1 = *not at all* to 5 = *completely*) and as an outside observer (i.e., third-person visual perspective; 1 = *not at all* to 5 = *completely*), given that individuals can experience both visual perspectives when recalling autobiographical events[46]; (c) the emotional valence of the memory at the present moment (1 = *very unpleasant*, 3 = *neither pleasant not unpleasant*, 5 = *very pleasant*); (d) the emotional valence of the original event at the time it occurred (1 = *very unpleasant*, 3 = *neither pleasant not unpleasant*, 5 = *very pleasant*); and (e) how often they had thought or recalled the memory (i.e., rehearsal frequency; 1 = *never* to 5 = *many times*).

Event importance

Participants also rated each event's importance for their self-identity ("*To what extent do you feel that this event has become a central part of your identity and life story?*") and for defining that particular lifetime period ("*To what extent do you feel that this event is central in defining that particular period of your life?*") on a unipolar scale (1 = *not at all* to 5 = *very much*).

Results

Dataset preparation

In total, participants retrieved 1880 memories across all experimental conditions (98% out of the 1920 trials). Prior to any analysis, the contents of each memory description were evaluated by a trained research assistant for their validity as an episodic AM[5,10] as well as their conformity to the criteria of each experimental condition (i.e., recalling unique events or repeated events, respectively, from the recent or the distant past). The contents of about 400 randomly selected AMs were also evaluated independently by the first author. Inter-rater reliability between the two coders was strong (Cohen's weighted $\kappa = 0.91$, $SE = 0.02$), and any discrepancies were resolved through discussion. In total, only 32 responses (1.69%) were classified as non-valid and were excluded from analysis either because they referred to personal semantic knowledge (i.e., autobiographical facts in the form of generic statements with no contextual details, such as *"I prefer drinking tea to coffee"*) or because they violated other task requirements.

Aggregated datasets were then prepared for analyses, whereby mean values for each variable (e.g., retrieval latency or ratings of event importance for self-identity, vividness, etc.) were calculated for each of the four conditions in each participant[5,10].

Measure	Event type		Temporal distance	
	Unique	Repeated	Recent	Distant
Number of AMs				
Total number of AMs	15.57 (0.93)	15.28 (0.97)	15.52 (0.87)	15.33 (0.97)
Retrieval characteristics				
Direct retrieval (%)	51.93 (19.08)	58.06 (20.90)	57.24 (20.48)	52.75 (18.82)
Generative retrieval (%)	46.07 (20.19)	39.02 (19.87)	39.92 (20.08)	45.15 (18.80)
Retrieval latencies (msec)	8365 (3918)	7447 (3985)	7627 (3636)	8185 (4193)
Retrieval effort	2.25 (0.55)	2.11 (0.55)	2.05 (0.51)	2.31 (0.54)
Importance ratings				
Self-identity	2.22 (0.71)	2.50 (0.66)	2.31 (0.68)	2.41 (0.71)
Lifetime period	2.44 (0.67)	2.87 (0.63)	2.57 (0.66)	2.74 (0.64)
Memory characteristics				
Vividness	3.76 (0.54)	3.74 (0.53)	4.06 (0.57)	3.43 (0.51)
First-person perspective	3.90 (0.84)	3.90 (0.63)	4.22 (0.68)	3.58 (0.80)
Third-person perspective	2.31 (0.83)	2.28 (0.82)	2.04 (0.81)	2.55 (0.84)
Emotional valence now	3.75 (0.45)	3.59 (0.41)	3.58 (0.41)	3.76 (0.47)
Emotional valence then	3.63 (0.49)	3.54 (0.39)	3.47 (0.46)	3.69 (0.51)
Rehearsal frequency	2.38 (0.52)	2.59 (0.52)	2.45 (0.54)	2.52 (0.59)

Table 1. Descriptive data stratified by event type and temporal distance. Note. Data represent means (and standard deviations); AMs = autobiographical memories.

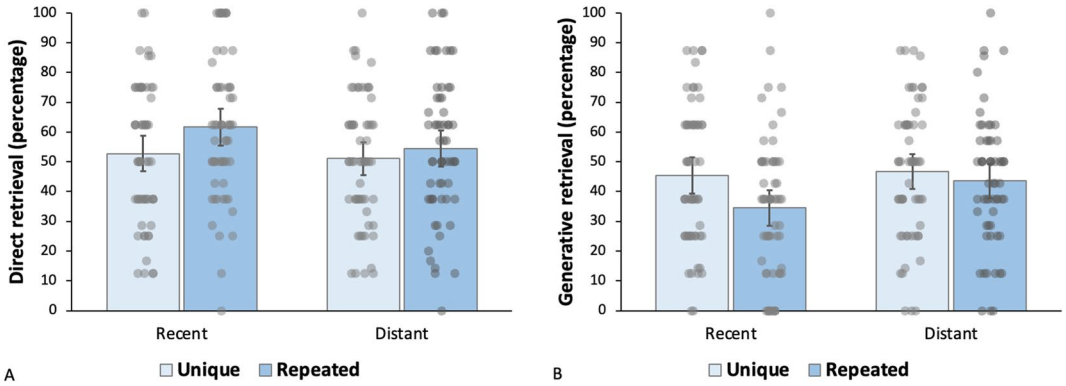


Fig. 1. Prevalence of direct (panel **A**) and generative (panel **B**) retrieval across all conditions. Grey points represent individual scores ($N = 60$). Error bars represent 95% confidence intervals.

Data on retrieval, ratings of personal importance and several memory characteristics were analysed with a series of 2 · 2 repeated measures analysis of variance with event type (unique vs. repeated autobiographical events) and temporal distance (recent vs. distant past) as the within-subjects variables. Representative examples of memories of unique and repeated events from the recent and distant past are presented in Table A2 of the Appendix. Descriptive statistics stratified by event type and temporal distance are presented in Table 1.

Effects of event type and temporal distance on retrieval processes

Number of valid memories

There were no significant main effects of event type, $F(1,59) = 3.02$, $p = .088$, $\eta_p^2 = 0.05$, temporal distance, $F(1,59) = 1.47$, $p = .230$, $\eta_p^2 = 0.02$, or an interaction effect, $F(1,59) = 0.28$, $p = .596$, $\eta_p^2 < 0.01$, on the number of valid AMs retrieved (Table 1).

Prevalence of direct and generative retrieval

Analysis yielded a significant main effect of event type on the proportion of direct AM retrieval, $F(1,59) = 6.14$, $p = .016$, $\eta_p^2 = 0.09$. Overall, the prevalence of direct retrieval was higher for repeated events compared to unique events. There was also a marginally significant effect of temporal distance, $F(1,59) = 3.89$, $p = .053$, $\eta_p^2 = 0.06$, with slightly higher direct retrieval rates for recent events compared to temporally distant events. There was no significant interaction effect, $F(1,59) = 2.30$, $p = .135$, $\eta_p^2 = 0.04$ (Fig. 1A).

A similar analysis on the percentage of generatively recalled AMs showed a significant main effect of event type, $F(1,59) = 7.58$, $p = .008$, $\eta_p^2 = 0.12$, and of temporal distance, $F(1,59) = 5.50$, $p = .022$, $\eta_p^2 = 0.09$. Overall,

the rate of generative retrieval was higher for unique events compared to repeated events and for distant events compared to recent events. There was also a significant interaction effect, $F(1,59) = 4.29$, $p = .043$, $\eta_p^2 = 0.07$.

Analysis of simple main effects showed that the effect of event type was significant for recent events, $F(1,59) = 11.79$, $p = .001$, $\eta_p^2 = 0.17$, with higher rates of generative retrieval for recent unique than recent repeated events, while the difference between distant unique and distant repeated events was not significant, $F(1,59) = 1.03$, $p = .314$, $\eta_p^2 = 0.02$ (Fig. 1B). Alternatively, the effect of temporal distance was significant only for repeated events, $F(1,59) = 10.03$, $p = .002$, $\eta_p^2 = 0.14$, with higher generative retrieval rates for memories of repeated events from the distant past compared to memories of recent repeated events while the rates of generative retrieval for distant and recent unique events did not differ from each other, $F(1,59) = 0.23$, $p = .636$, $\eta_p^2 < 0.01$ (Fig. 1B).

Retrieval latencies

A similar repeated measures ANOVA on retrieval latencies showed a main effect of event type, $F(1,59) = 8.19$, $p = .006$, $\eta_p^2 = 0.12$, with longer latencies recorded for memories of unique events compared to repeated events. While recent events were recalled faster than distant events, the effect of temporal distance approached but did not reach statistical significance, $F(1,59) = 3.52$, $p = .066$, $\eta_p^2 = 0.06$.

There was also a small to medium event type by temporal distance interaction effect, which did not reach statistical significance, $F(1,59) = 3.65$, $p = .061$, $\eta_p^2 = 0.06$ (Fig. 2A). We followed this up with analysis of simple main effects, which showed that the effect of event type was significant for recent events, $F(1,59) = 9.75$, $p = .003$, $\eta_p^2 = 0.14$, with longer latencies for recent unique than recent repeated events, while the difference between distant unique and distant repeated events was not significant, $F(1,59) = 0.10$, $p = .750$, $\eta_p^2 < 0.01$ (Fig. 2A). Alternatively, the effect of temporal distance was significant only for repeated events, $F(1,59) = 8.56$, $p = .005$, $\eta_p^2 = 0.13$, with longer latencies for memories of repeated events from the distant past compared to memories of recent repeated events, while the retrieval latencies for distant and recent unique events did not differ from each other, $F(1,59) = 0.14$, $p = .707$, $\eta_p^2 < 0.01$ (Fig. 2A).

Furthermore, it is worth noting that retrieval latencies were substantially shorter for directly ($M = 4992$, $SD = 3696$) versus generatively ($M = 11529$, $SD = 9731$) retrieved memories, $t(1832) = -19.79$, $p < .001$, $d = -0.93$. Importantly, the discrepancy between directly and generatively retrieved AMs was robust across event types as well as temporal conditions [direct unique ($M = 5167$, $SD = 2301$) vs. generative unique ($M = 12102$, $SD = 6185$): $t(60) = -10.96$, $p < .001$, $d = -1.40$; direct repeated ($M = 4820$, $SD = 2284$) vs. generative repeated ($M = 10869$, $SD = 6480$): $t(58) = -8.75$, $p < .001$, $d = -1.35$; direct recent ($M = 4886$, $SD = 1980$) vs. generative recent ($M = 11268$, $SD = 5831$): $t(60) = -10.52$, $p < .001$, $d = -1.40$; direct distant ($M = 5104$, $SD = 2430$) vs. generative distant ($M = 11584$, $SD = 6165$): $t(60) = -10.64$, $p < .001$, $d = -1.36$].

Retrieval effort

A similar repeated measures ANOVA on subjective effort ratings showed a significant main effect of event type, $F(1,59) = 5.32$, $p = .025$, $\eta_p^2 = 0.08$, with unique events being reportedly retrieved more effortfully compared to repeated events. Additionally, there was a large effect of temporal distance, $F(1,59) = 27.04$, $p < .001$, $\eta_p^2 = 0.31$, with higher effort ratings recorded when retrieving events from the distant past compared to recent events. There was no significant interaction effect, $F(1,59) = 1.00$, $p = .321$, $\eta_p^2 = 0.02$ (Fig. 2B).

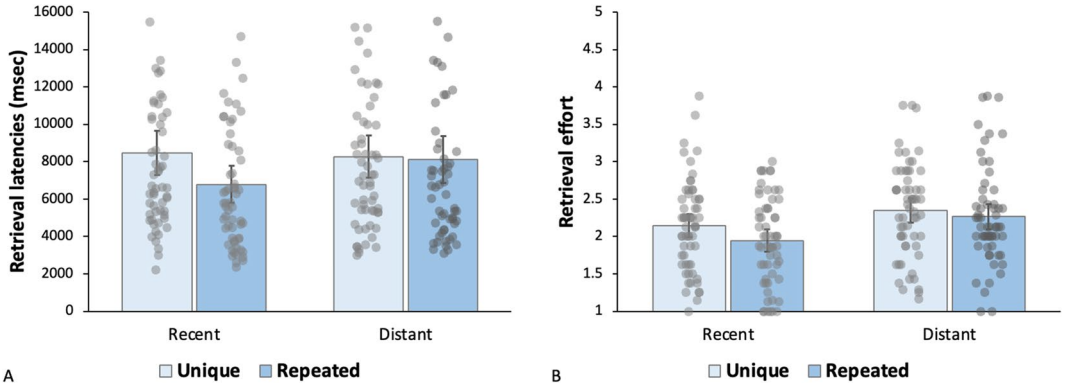


Fig. 2. Retrieval latencies (panel **A**) and effort ratings (panel **B**) across all conditions. Grey points represent individual scores ($N = 60$). A cross shows the mean score. Error bars represent 95% confidence intervals.

Effects of event type and temporal distance on event importance ratings

Importance for self-identity

The analysis on ratings of importance for self-identity resulted in a significant effect of event type, $F(1,59) = 15.13$, $p < .001$, $\eta_p^2 = 0.20$, with memories of repeated events being overall rated as more important than unique events. By contrast, the main effect of temporal distance was not significant, $F(1,59) = 1.90$, $p = .173$, $\eta_p^2 = 0.03$, but it interacted with the event type, $F(1,59) = 12.39$, $p < .001$, $\eta_p^2 = 0.17$. Analysis of simple main effects showed that the effect of event type on self-identity importance ratings was significant for recent events, $F(1,59) = 25.73$, $p < .001$, $\eta_p^2 = 0.30$, but not for distant events $F(1,59) = 0.19$, $p = .669$, $\eta_p^2 < 0.01$ (Fig. 3A). An alternative set of

simple main effects showed that temporal distance was significant only for unique events, $F(1,59) = 11.92$, $p < .001$, $\eta_p^2 = 0.17$, with unique distant events being rated as more important than unique recent events, while ratings of importance for repeated events were equally high for recent and distant events, $F(1,59) = 1.61$, $p = .210$, $\eta_p^2 = 0.03$ (Fig. 3A).

Importance for lifetime period

A similar ANOVA on ratings of life-period importance revealed a large main effect of event type, $F(1,59) = 33.39$, $p < .001$, $\eta_p^2 = 0.36$, with memories of repeated events being rated substantially more important than unique events. The main effect of temporal distance was also significant, $F(1,59) = 5.41$, $p = .024$, $\eta_p^2 = 0.08$, with higher importance ratings for memories of distant events compared to recent events. In addition, there was a significant interaction effect, $F(1,59) = 15.38$, $p < .001$, $\eta_p^2 = 0.21$. Analysis of simple main effects showed that the effect of event type on ratings of life-period importance was significant for both recent events, $F(1,59) = 36.95$, $p < .001$, $\eta_p^2 = 0.85$, and for distant events $F(1,59) = 4.93$, $p = .030$, $\eta_p^2 = 0.08$, but it was substantially larger for recent events (Fig. 3B). Another set of simple main effects on ratings of life-period importance showed that the effect of temporal distance was significant only for unique events, $F(1,59) = 21.64$, $p < .001$, $\eta_p^2 = 0.27$, with unique distant events being rated as more important than unique recent events, while the importance ratings for repeated events were equally high for recent and distant events, $F(1,59) = 0.55$, $p = .462$, $\eta_p^2 = 0.01$ (Fig. 3B).

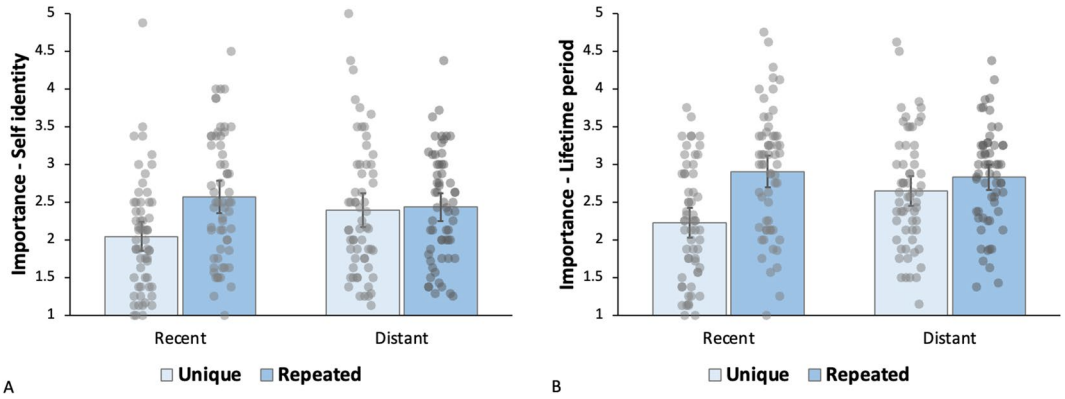


Fig. 3. Importance ratings for self-identity (panel **A**) and lifetime period (panel **B**) across all conditions. Grey points represent individual scores ($N = 60$). Error bars represent 95% confidence intervals.

Effects of event type and temporal distance on memory characteristics

Vividness

There was no significant effect of event type on vividness, with memories of repeated events being rated as vivid as the memories of unique events, $F(1,59) = 0.12$, $p = .733$, $\eta_p^2 < 0.01$. However, there was a large effect of temporal distance, $F(1,59) = 95.42$, $p < .001$, $\eta_p^2 = 0.62$, with higher vividness ratings for recent events compared to distant events. There was also a significant event type by temporal distance interaction effect, $F(1,59) = 4.93$, $p = .030$, $\eta_p^2 = 0.08$. Analysis of simple main effects on vividness showed that the effect temporal distance was significant across both unique events, $F(1,59) = 106.65$, $p < .001$, $\eta_p^2 = 0.64$, and repeated events, $F(1,59) = 38.80$, $p < .001$, $\eta_p^2 = 0.40$, but it was substantially larger for unique events (Fig. 4A).

Visual perspective

There was no significant main effect of event type on the first-person visual perspective score, $F(1,59) < 0.01$, $p = .962$, $\eta_p^2 < 0.01$, or on the third-person visual perspective score $F(1,59) = 0.07$, $p = .798$, $\eta_p^2 < 0.01$, with similar visual perspective ratings recorded across unique and repeated events. By contrast, there was a significant main effect of temporal distance on first-person, $F(1,59) = 69.72$, $p < .001$, $\eta_p^2 = 0.54$, and third-person perspective scores, $F(1,59) = 27.22$, $p < .001$, $\eta_p^2 = 0.32$. Higher first-person perspective scores were recorded for memories of recent events compared to temporally distant events, whilst higher third-person perspective scores were recorded for memories of distant events compared to recent events. There were no significant interaction effects for first-person perspective, $F(1,59) = 0.21$, $p = 652$, $\eta_p^2 < 0.51$, or third-person perspective ratings, $F(1,59) = 0.27$, $p = 605$, $\eta_p^2 < 0.01$ (Fig. 4C and D).

Rehearsal frequency

A 2 × 2 repeated measures ANOVA on ratings of memory rehearsal revealed a significant main effect of event type, $F(1,59) = 11.43$, $p = .001$, $\eta_p^2 = 0.16$, with memories of repeated events having been more frequently rehearsed than unique events. The effect of temporal distance on rehearsal frequency was not significant, $F(1,59) = 0.73$, $p = .396$, $\eta_p^2 = 0.01$, but it interacted with the event type, $F(1,59) = 41.45$, $p < .001$, $\eta_p^2 = 0.41$. Analysis of simple main effects showed that the effect of event type was significant for both recent events, $F(1,59) = 38.09$, $p < .001$, $\eta_p^2 = 0.39$, and distant events, $F(1,59) = 9.36$, $p = .003$, $\eta_p^2 = 0.14$, but in opposite directions. Thus, for recent events, memories of repeated events were significantly more often rehearsed than unique events (Fig. 4B). However, for distant events, unique events were reported as having been more often rehearsed than repeated

events (Fig. 4B). Similarly, memories of unique distant events were more frequently rehearsed than unique recent events, $F(1,59) = 24.89$, $p < .001$, $\eta_p^2 = 0.30$, while memories of repeated recent events were more rehearsed than repeated distant events, $F(1,59) = 10.05$ $p = .002$, $\eta_p^2 = 0.15$ (Fig. 4B).

Emotional valence

For the emotional valence of memories and original events, we ran a 2 (event type: unique vs. repeated events) by 2 (temporal distance: recent vs. distant past) by 2 (time: now vs. then) repeated measures ANOVA. Results showed a significant main effect of event type, $F(1,59) = 12.16$, $p < .001$, $\eta_p^2 = 0.17$, with memories of unique events being rated overall more positively compared to repeated events. There was also a significant main effect of temporal distance, $F(1,59) = 14.12$, $p < .001$, $\eta_p^2 = 0.19$, with distant events being rated more positively compared to recent events. These main effects were qualified by a significant event type by temporal distance interaction, $F(1,59) = 6.16$, $p = .016$, $\eta_p^2 = 0.09$. Analysis of simple main effects showed that unique events were more positively rated than repeated events only when the events were from recent past, $F(1,59) = 16.58$, $p < .001$, $\eta_p^2 = 0.22$, but not when they were from a distant past, $F(1,59) = 0.83$, $p = .367$, $\eta_p^2 = 0.01$ (Fig. 4E). Alternatively, the effect of temporal distance on emotional valence was significant only for repeated events, $F(1,59) = 19.87$, $p < .001$, $\eta_p^2 = 0.25$, with distant events being rated more positively than recent events (Fig. 4E). The effect of time was not significant, $F(1,59) = 1.25$, $p = .268$, $\eta_p^2 = 0.02$. There were no other significant interaction effects (event type by time: $F(1,59) = 0.25$, $p = .616$, $\eta_p^2 < 0.01$; temporal distance by time: $F(1,59) = 0.08$, $p = .774$, $\eta_p^2 < 0.01$; event type by temporal distance by time: $F(1,59) = 0.02$, $p = .882$, $\eta_p^2 < 0.01$; Fig. 4E).

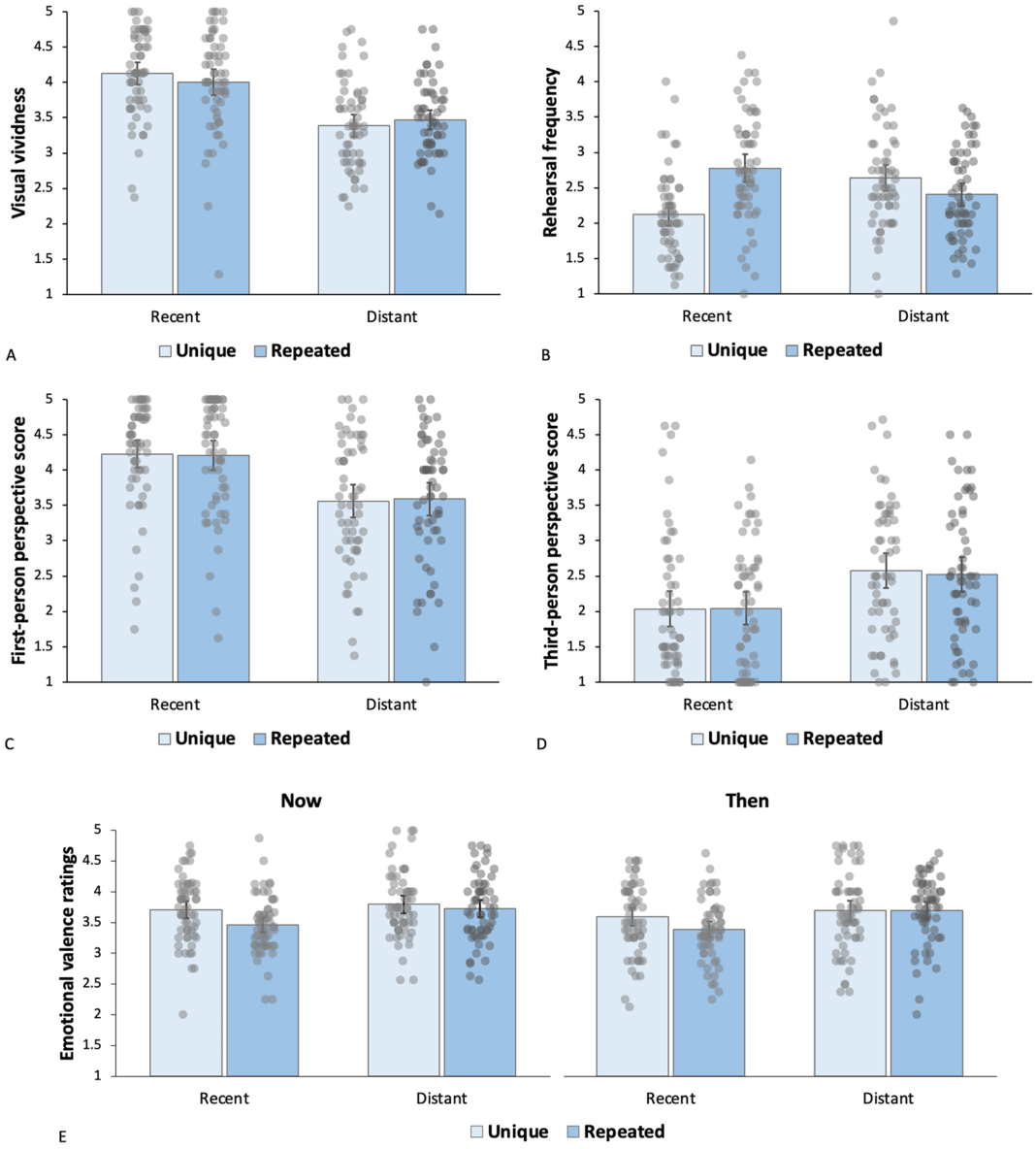


Fig. 4. Phenomenological memory characteristics, including visual imagery vividness (panel **A**), rehearsal frequency (panel **B**), first-person (panel **C**) and third-person (panel **D**) visual perspective scores, and emotional valence ratings (panel **E**) across all conditions. Grey points represent individual scores ($N = 60$). Error bars represent 95% confidence intervals.

Discussion

To our knowledge, this is the first study that systematically compared the retrieval characteristics, phenomenological qualities, and perceived importance for self-identity of autobiographical memories (AMs) for unique (i.e., specific) and repeated (i.e., categorical) events. The study resulted in several novel findings that have important theoretical and practical implications for research on AM in general, and the relation between AM and the sense of self and identity, in particular. Firstly, with respect to retrieval processes, direct retrieval was reported more often for memories of repeated events than memories of unique events while higher rates of generative retrieval were observed for memories of unique events, particularly for unique events that had taken place recently. This pattern was further corroborated by significantly higher ratings of retrieval effort and longer retrieval latencies for memories of unique events compared to repeated events, particularly for the recent past. Furthermore, directly retrieved AMs were consistently recalled faster than generatively retrieved AMs, irrespective of the type of the event recalled or its temporal distance from the present, providing novel converging evidence regarding the cognitive demands of these processes under different conditions. Taken together, these findings indicate that recalling repeated events is faster and less effortful than recalling unique (highly-specific) events, which suggests that the retrieval of highly-specific, one-off autobiographical events relies on top-down strategic search operations to a greater extent than recalling repeated events from one's past. Importantly, these findings also suggest that repeated events are more easily accessible than memories of unique events, in support of Conway's hierarchical organisation model of AM contents[1,26]. Experiencing similar events repeatedly can strengthen their associated episodic memories by enhancing the similarity of their neural representations, effectively establishing a consistent memory trace when those representations are reactivated across different episodes[47].

Nevertheless, it is also worth noting that, in our study, we consistently found higher rates of direct retrieval than generative retrieval, irrespective of the temporal distance and type of the event recalled. Imposing specificity and temporal retrieval restrictions may disrupt the natural retrieval processes by engaging executive monitoring and strategic search operations[10], with higher rates of direct retrieval expected in unrestricted conditions compared to restricted retrieval conditions[48]. These findings accord well with previous empirical evidence (e.g,[8,10,19,20,34]) as well as theoretical accounts[35,36,49] highlighting the primacy of automatic associative retrieval processes in autobiographical memory.

The second central set of findings concerns the personal significance ratings for the two event types. Repeated events were perceived as holding a more central place in one's identity and personal life story compared to unique events. They were also rated as more important in defining a particular period of one's life compared to unique events. Overall, these findings suggest that recurring experiences constitute salient forms of internal representations of one's personal past, that substantially contribute to the establishment of the conceptual self and the development of an autobiographical knowledge base. Previous research has also found that young adults rate their childhood memories of unique and repeated events as equally important and personally meaningful[23]. The similarity of the instances composing the repeated events can shift their proximity to semantic or episodic memory, with highly similar events abstracted away from specific details and merged into more generic memory representations[16]. Thus, repeated events may represent more semanticised forms of AM than unique events[15,18]. Future studies should examine whether similar patterns can also be observed in older adults. Given well-established temporal distance effects like the reminiscence bump effect, which refers to the disproportionately high number of events recalled by older individuals from their teenage years and early adulthood[41], older events could play a more prominent role in older adult's identity than more recent events. Furthermore, given that older adults tend to exhibit a reduction in recalling specific episodic details in their AMs[50,51], repeated events, which reflect more generalised schematic representations of personal experiences than unique events[15,16,18], may become more dominant anchors for their identity.

Episodic autobiographical memory as well as personal semantic knowledge (such as autobiographical facts and self-knowledge) play a pivotal role not only in keeping a sense of self-identity in the present moment but they are also important in maintaining a sense of self over time[39,52]. Importantly, in our study, repeated events held comparable personal significance weights across the recent and remote past, confirming that recurrent experiences are crucial in supporting dynamic self-identity representations in the present moment as well as more crystallised self-representations across time. By contrast, unique events that had occurred in the distant past held higher personal importance than recent unique events, suggesting that one-off experiences might require more time for reflection and integration before they start contributing to self-identity. While retention of AMs typically declines over time[53], preserved retention may apply to more rehearsed events or more salient experiences, such as events with high emotional intensity[54], whilst less significant memories are forgotten. These findings converge with the notion that, while singular, major life events can act as turning points in forming identity representations, self-concept development is an ongoing process of integrating daily experiences over time[55].

Thirdly, the final set of novel results showed that the phenomenological memory characteristics of the two event types were similar in several aspects, particularly with respect to mental visualisation. More specifically, memories of unique and repeated events did not differ in visual imagery vividness ratings. Furthermore, similar visual perspective ratings were recorded across unique and repeated events, with much higher scores for first-person perspective than third-person perspective across both event types. Our findings accord with the notion that spatial contextualisation constitutes a central feature for AMs of both unique and repeated events[29], particularly with regards to detailed visual imagery and first-person perspective dominance[15,25,28]. On the other hand, we found that memories of unique events were rated more positively than repeated events, especially when the events were recent. Compared to unique events, past research has also found the recollective experience of repeated events to be less intense in certain aspects, including lower emotional intensity, reduced temporal specificity, and fewer episodic details (e.g. [11,12,14,22,23]). Our findings corroborate previous reports and further support that the emotionality of recalling unique and repeated experiences may be modulated by temporal proximity. Finally, we found that, overall, repeated events had been more frequently rehearsed than unique events, although rehearsal frequency varied depending on the temporal distance. Specifically, repeated events

had been more often rehearsed than unique events in the recent past, while for remote events, unique events had been slightly more often rehearsed than repeated events. The rehearsal frequency findings are also aligned with the retrieval characteristics of the memories recalled, with higher generative retrieval rates and longer retrieval latencies recorded for unique recent events compared to repeated recent events, confirming that rehearsing AMs in the form of private reflection or social sharing can further enhance memory consolidation, leading to their enhanced accessibility (e.g.[56]).

To conclude, our results indicate that, overall, memories of repeated events constitute highly accessible forms of AM representations, that are essential in representing one's personal past, bearing substantial intrinsic weight in constructing and maintaining one's self-identity. These findings challenge the idea that repeated events involve predominantly overgeneral memory representations that should be excluded from AM research, particularly in typical populations (cf[23]). Instead, given their prevalence in daily life, accessibility, subjective value, and substantial overlap with the characteristics of unique events, our findings call for greater attention to repeated events and underscore the need to include them in basic and applied AM research. Our findings also contribute to models of declarative memory systems that situate autobiographical knowledge at the crossroads of episodic and semantic memory[15,16,18], and provide novel empirical evidence supporting the close proximity between unique and repeated events as highly contextualised forms of episodic autobiographical representations.

Data availability

The datasets that support the findings of this study are available from the corresponding author upon reasonable request.

Appendix

Appendix see Table A1 and A2

	Psycholinguistic characteristics			
Word-cue	**Concreteness**	**Imagery**	**Familiarity**	**Emotional valence**
Aunt	5.79	5.57	6.46	5
Ball	6.08	6.25	6.42	5.01
Biscuit	5.7	5.65	5.95	4.61
Boat	6.33	6.25	6.58	4.72
Book	6.09	5.6	6.78	5.02
Brother	6	5.75	6.79	5.49
Cake	6.11	6.23	6.6	5.38
Camera	6.23	5.7	6.24	4.87
Candle	6.27	6.14	6.66	4.88
Car	6.35	6.22	6.8	5.09
Chair	6.12	5.89	6.65	4.24
Children	5.78	5.93	6.64	5.03
Coffee	6.43	5.79	6.39	4.73
Film	6.02	5.73	6.25	5.32
Friend	4.4	5.63	6.5	6.16
Garden	5.92	6.23	6.53	6.07
House	5	5.46	6.47	4.43
Ice-cream	5.93	6.45	6.49	5.66
Letter	5.31	5.46	6.48	5.05
Library	5.38	5.36	6.31	4.63
Map	5.61	5.81	6.43	4.38
Morning	5.11	5.8	6.57	5.29
Park	5.45	5.61	6.37	5.04
Pencil	6.22	5.98	6.4	4.39
Phone	6.2	5.81	6.24	4.53
Rain	5.85	5.89	6.43	5.23
River	6.25	6.14	6.78	6.09
School	5.49	5.72	6.47	3.84
Shop	6.21	5.79	6.34	5.08
Snow	6.14	5.87	6.59	5.32
Street	5.84	5.29	6.59	4.05
Sunset	5.12	6.21	6.25	6.04
Total	M = 5.84 (SD = 0.47)	M = 5.85 (SD = 0.29)	M = 6.48(SD = 0.19)	M= 5.02 (SD = 0.58)

Table A1. Word-cues and their psycholinguistic characteristics.

Examples of memories
Unique recent events
It was my friend's birthday a couple of weeks ago, and my other friend made a cake and brought it to her house as a semi-surprise
I was in my house with my flatmate, and she offered me cookies and tea, and she looked at me and asked which of the candles that we had on the table would I prefer to light
Seeing my former students outside during the May bank holiday this May
I was bleaching my t-shirt in a cool way in the garden of my house
My car broke down a few months ago and I got stuck in London for ages, hours and hours
Unique distant events
I was in my aunt's place, and in the fridge, I saw a cube, I thought it was candy or chocolate, but it was a stock cube, a chicken stock cube; I asked, "aunt, can I eat the chocolate?", she said, "yeah", and I just took out the wrapper and ate it; and it was disgusting.
Me and my father and some friends, we rented a boat while on holiday in another country, and we spent the evening going around on the boat
I was a teenager; GTA5 came out, and part of the CD, it had a huge card of the game where you could put it up as a poster; I think that was the first time I held a map in my hands, I thought that was pretty cool
I really wanted to have this book, it was a very beautiful book with beautiful pictures, it was golden, and I got it for my birthday, and I was very happy
I was changing schools, I went to a new school, and I remember I was driving with my mom to the new school and I was very worried
Repeated recent events
My friend works at a coffee shop, so I've been visiting him at work every weekend of the last year
It was my friend from the Netherlands sending me pictures and videos of potential houses he wanted to rent every single day
Every Tuesday I have a church service, and we go there, and after the service is done, we need to fold up the chairs
I have a memory, especially during this time of the year, so less so during the winter, the ice cream truck comes every day in front of my house at around 6pm, and I hear the sound; on the street, obviously, it comes on the street
Playing sudoku on my phone on the tube
Repeated distant events
During my childhood, me and my dad coming home; So, he would pick me up from the car and then we'd go home, and then he would open our letterbox to check the mail, and then I'd see him flicker through the letters, and then getting inside the house
Playing football with my brothers and my cousins in my granddad's house in the summertime
Me and my mom used to go roller skating in a park near our house
I remember going to the library in the summer every year to take books
I was around 12, moving to the Australian school; during lunch I didn't really have any friends, so I would go to the library and start reading comic books

Table A2. Examples of memories of unique and repeated events from the recent and distant past.

Received: 31 March 2026; Accepted: 16 July 2026
Published online: 03 August 2026

References

1. Conway, M. A. Memory and the self. *J. Mem. Lang.* **53**, 594–628. https://doi.org/10.1016/j.jml.2005.08.005 (2005).
2. Berntsen, D. & Rubin, D. C. Emotionally charged autobiographical memories across the life span: The recall of happy, sad, traumatic and involuntary memories. *Psychol. Aging* **17**, 636–652. https://doi.org/10.1037/0882-7974.17.4.636 (2002).
3. Williams, H. L., Conway, M. A. & Cohen, G. *Autobiographical Memory* 21–90 (Psychology Press, 2008).
4. Barsalou, L. W. in *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory* (eds Neisser, U. & Winograd, E.) 193–243 (Cambridge University Press, 1988). https://doi.org/10.1017/CBO9780511664014.009 (1988).
5. Schlagman, S. & Kvavilashvili, L. Involuntary autobiographical memories in and outside the laboratory: How different are they from voluntary autobiographical memories? *Mem. Cognit.* **36**, 920–932. https://doi.org/10.3758/MC.36.5.920 (2008).
6. Barzykowski, K. & Niedźwieńska, A. Priming involuntary autobiographical memories in the lab. *Memory* **26**, 277–289. https://doi.org/10.1080/09658211.2017.1353102 (2018).
7. Barzykowski, K., Niedźwieńska, A. & Mazzoni, G. How intention to retrieve a memory and expectation that a memory will come to mind influence the retrieval of autobiographical memories. *Conscious. Cogn.* **72**, 31–48. https://doi.org/10.1016/j.concog.2019.03.011 (2019).
8. Barzykowski, K. & Mazzoni, G. Do intuitive ideas of the qualities that should characterize involuntary and voluntary memories affect their classification?. *Psychol. Res.* **86**, 170–195. https://doi.org/10.1007/s00426-020-01465-3 (2022).
9. Griffith, J. W. et al. An item response theory/confirmatory factor analysis of the autobiographical memory test. *Memory* **17**, 609–623. https://doi.org/10.1080/09658210902939348 (2009).
10. Markostamou, I., Randall, C. & Kvavilashvili, L. Dissociations between directly and generatively retrieved autobiographical memories: Evidence from ageing. *Memory* **31**, 931–947. https://doi.org/10.1017/S0140525X23000080 (2023).
11. Ford, J. H., Addis, D. R. & Giovanello, K. S. Differential neural activity during search of specific and general autobiographical memories elicited by musical cues. *Neuropsychologia* **49**, 2514–2526. https://doi.org/10.1016/j.neuropsychologia.2011.04.032 (2011).
12. Holland, A. C., Addis, D. R. & Kensinger, E. A. The neural correlates of specific versus general autobiographical memory construction and elaboration. *Neuropsychologia* **49**, 3164–3177. https://doi.org/10.1016/j.neuropsychologia.2011.07.015 (2011).
13. Addis, D. R., McIntosh, A. R., Moscovitch, M., Crawley, A. P. & McAndrews, M. P. Characterizing spatial and temporal features of autobiographical memory retrieval networks: A partial least squares approach. *Neuroimage* **23**, 1460–1471. https://doi.org/10.1016/j.neuroimage.2004.08.007 (2004).
14. Addis, D. R., Moscovitch, M., Crawley, A. P. & McAndrews, M. P. Recollective qualities modulate hippocampal activation during autobiographical memory retrieval. *Hippocampus* **14**, 752–762. https://doi.org/10.1002/hipo.10215 (2004).
15. Tanguay, A. F. et al. The shared and unique neural correlates of personal semantic, general semantic, and episodic memory. *eLife* **12**, e83645. https://doi.org/10.7554/eLife.83645 (2023).

16. Bontkes, O. R., Palombo, D. J. & Rubínová, E. Similarity is associated with where repeated-event memories fall on the semantic–episodic continuum. *Mem. Cognit*. **53**, 2635–2654. https://doi.org/10.3758/s13421-025-01729-6 (2025).
17. Renoult, L. et al. Personal semantics: Is it distinct from episodic and semantic memory? An electrophysiological study of memory for autobiographical facts and repeated events in honor of Shlomo Bentin. *Neuropsychologia* **83**, 242–256. https://doi.org/10.1016/j.neuropsychologia.2015.08.013 (2016).
18. Renoult, L., Irish, M., Moscovitch, M. & Rugg, M. D. From knowing to remembering: The semantic–episodic distinction. *Trends Cogn. Sci.* **23**, 1041–1057. https://doi.org/10.1016/j.tics.2019.09.008 (2019).
19. Uzer, T., Lee, P. J. & Brown, N. R. On the prevalence of directly retrieved autobiographical memories. *J. Exp. Psychol. Learn. Mem. Cogn.* **38**, 1296–1308. https://doi.org/10.1037/a0028142 (2012).
20. Harris, C. B., O'Connor, A. R. & Sutton, J. Cue generation and memory construction in direct and generative autobiographical memory retrieval. *Conscious. Cogn.* **33**, 204–216. https://doi.org/10.1016/j.concog.2014.12.012 (2015).
21. Hallford, D. J., Rusanov, D., Yeow, J. J. E. & Barry, T. J. Overgeneral and specific autobiographical memory predict the course of depression: An updated meta-analysis. *Psychol. Med.* **51**, 909–926. https://doi.org/10.1017/s0033291721001343 (2021).
22. Levine, B. et al. The functional neuroanatomy of episodic and semantic autobiographical remembering: A prospective functional MRI study. *J. Cogn. Neurosci.* **16**, 1633–1646. https://doi.org/10.1162/0898929042568587 (2004).
23. Peterson, C., Baker-Ward, L. & Grovenstein, T. N. Childhood remembered: Reports of both unique and repeated events. *Memory* **24**, 240–256. https://doi.org/10.1080/09658211.2014.1001991 (2016).
24. Dilevski, N., Paterson, H. M., Walker, S. A. & Van Golde, C. Adult memory for specific instances of a repeated event: A preliminary review. *Psychiatry Psychol. Law* **28**, 711–732. https://doi.org/10.1080/13218719.2020.1837031 (2021).
25. Rubin, D. C., Schrauf, R. W. & Greenberg, D. L. Belief and recollection of autobiographical memories. *Mem. Cognit.* **31**, 887–901. https://doi.org/10.3758/BF03196443 (2003).
26. Conway, M. A. & Pleydell-Pearce, C. W. The construction of autobiographical memories in the self-memory system. *Psychol. Rev.* **107**, 261–288. https://doi.org/10.1037/0033-295X.107.2.261 (2000).
27. Sheldon, S., Peters, S. & Renoult, L. Altering access to autobiographical episodes with prior semantic knowledge. *Conscious. Cogn.* **86**, 103039. https://doi.org/10.1016/j.concog.2020.103039 (2020).
28. Rubin, D. C. & Umanath, S. Event memory: A theory of memory for laboratory, autobiographical, and fictional events. *Psychol. Rev.* **122**, 1–23. https://doi.org/10.1037/a0037907 (2015).
29. Robin, J., Wynn, J. & Moscovitch, M. The spatial scaffold: The effects of spatial context on memory for events. *J. Exp. Psychol. Learn. Mem. Cogn.* **42**, 308–315. https://doi.org/10.1037/xlm0000167 (2016).
30. Ghosh, V. E. & Gilboa, A. What is a memory schema? A historical perspective on current neuroscience literature. *Neuropsychologia* **53**, 104–114. https://doi.org/10.1016/j.neuropsychologia.2013.11.010 (2014).
31. Waters, T. E., Bauer, P. J. & Fivush, R. Autobiographical memory functions served by multiple event types. *Appl. Cogn. Psychol.* **28**, 185–195. https://doi.org/10.1002/acp.2976 (2014).
32. D'Argembeau, A. Zooming in and out on one's life: Autobiographical representations at multiple time scales. *J. Cogn. Neurosci.* **32**, 2037–2055. https://doi.org/10.1162/jocn_a_01556 (2020).
33. Gilboa, A. & Moscovitch, M. No consolidation without representation: Correspondence between neural and psychological representations in recent and remote memory. *Neuron* **109**, 2239–2255. https://doi.org/10.1016/j.neuron.2021.04.025 (2021).
34. Harris, C. B. & Berntsen, D. Direct and generative autobiographical memory retrieval: How different are they?. *Conscious. Cogn.* **74**, 102793. https://doi.org/10.1016/j.concog.2019.102793 (2019).
35. Berntsen, D. Involuntary autobiographical memories and their relation to other forms of spontaneous thoughts. *Philos. Trans. R. Soc. B* **376**20190693. https://doi.org/10.1098/rstb.2019.0693 (2021).
36. Kvavilashvili, L., Niedźwieńska, A., Gilbert, S. J. & Markostamou, I. Deficits in spontaneous cognition as an early marker of Alzheimer's Disease. *Trends Cogn. Sci.* **24**, 285–301. https://doi.org/10.1016/j.tics.2020.01.005 (2020).
37. Mace, J. H. Priming in the autobiographical memory system: Implications and future directions. *Memory* **32**, 694–708. https://doi.org/10.1080/09658211.2023.2277134 (2024).
38. Haque, S. & Conway, M. A. Sampling the process of autobiographical memory construction. *Eur. J. Cogn. Psychol.* **13**, 529–547. https://doi.org/10.1080/09541440125757 (2001).
39. Grilli, M. D. & Verfaellie, M. Supporting the self-concept with memory: Insight from amnesia. *Soc. Cogn. Affect. Neurosci.* **10**, 1684–1692. https://doi.org/10.1093/scan/nsv056 (2015).
40. Grilli, M. D. The association of personal semantic memory to identity representations: Insight into higher-order networks of autobiographical contents. *Memory* **25**, 1435–1443. https://doi.org/10.1080/09658211.2017.1315137 (2017).
41. Curci, A. et al. The reminiscence bump and the self: Evidence from five studies on positive and negative memories. *Memory* **32**, 757–775. https://doi.org/10.1080/09658211.2024.2325522 (2024).
42. D'Argembeau, A. & Van der Linden, M. Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Conscious. Cogn.* **13**, 844–858. https://doi.org/10.1016/j.concog.2004.07.007 (2004).
43. Faul, F., Erdfelder, E., Lang, A. G., Buchner, A. & G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav. Res. Methods*. **39**, 175–191. https://doi.org/10.3758/BF03193146 (2007).
44. Toglia, M. P. & Battig, W. F. *Handbook of Semantic Word Norms* (Lawrence Erlbaum, 1978).
45. Mair, A. Cueing autobiographical memory in young and older adults: An exploration of the effect of cue type on retrieval rates and memory characteristics. *Conscious. Cogn.* **138**, 103983. https://doi.org/10.1016/j.concog.2025.103983 (2026).
46. Rice, H. J. & Rubin, D. C. I can see it both ways: First-and third-person visual perspectives at retrieval. *Conscious. Cogn.* **18**, 877–890. https://doi.org/10.1016/j.concog.2009.07.004 (2009).
47. Xue, G. et al. Greater neural pattern similarity across repetitions is associated with better memory. *Science* **330**, 97–101. https://doi.org/10.1126/science.1193125 (2010).
48. Todd, E., Kvavilashvili, L., Henson, R. & Markostamou, I. Effects of task instructions on autobiographical memory retrieval in ageing. *OSF Preregistration*. https://doi.org/10.17605/OSF.IO/JSFRK (2026).
49. Moulin, C. J., Carreras, F. & Barzykowski, K. The phenomenology of autobiographical retrieval. *WIREs Cogn. Sci.* **14**, e1638. https://doi.org/10.1002/wcs.1638 (2023).
50. Gaesser, B., Sacchetti, D. C., Addis, D. R. & Schacter, D. L. Characterizing age-related changes in remembering the past and imagining the future. *Psychol. Aging* **26**, 80–84. https://doi.org/10.1037/a0021054 (2011).
51. Habermas, T., Diel, V. & Welzer, H. Lifespan trends of autobiographical remembering: Episodicity and search for meaning. *Conscious. Cogn.* **22**, 1061–1073. https://doi.org/10.1016/j.concog.2013.07.010 (2013).
52. Prebble, S. C., Addis, D. R. & Tippett, L. J. Autobiographical memory and sense of self. *Psychol. Bull.* **139**, 815–840. https://doi.org/10.1037/a0030146 (2013).
53. Rubin, D. C. & Wenzel, A. E. One hundred years of forgetting: A quantitative description of retention. *Psychol. Rev.* **103**, 734–760. https://doi.org/10.1037/0033-295X.103.4.734 (1996).
54. Su, H. et al. Retention and transformation of internal experiences in autobiographical memory narratives. *Commun. Psychol.* **4**, 56. https://doi.org/10.1038/s44271-026-00425-8 (2026).
55. Branje, S. Adolescent identity development in context. *Curr. Opin. Psychol.* **45**, 101286. https://doi.org/10.1016/j.copsyc.2021.11.006 (2022).

56. Ritchie, T. D. et al. Event self-importance, event rehearsal, and the fading affect bias in autobiographical memory. *Self Identity*. **5**, 172–195. https://doi.org/10.1080/15298860600591222 (2006).

Author contributions

IM conceptualised and designed the study, was responsible for the project administration, played a leading role in preparing the manuscript, ran the analysis, and prepared the figures; AFNT co-wrote the Introduction; LK provided a critical review of the manuscript; All co-authors were involved in discussions around the project findings and writing plans. All co-authors reviewed, revised, and approved the manuscript.

Funding

This research was supported with Quality-Related (QR) Research Funding by the Centre for Research in Psychology and Sports of the University of Hertfordshire awarded to Ioanna Markostamou.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

Correspondence and requests for materials should be addressed to I.M.

Reprints and permissions information is available at www.nature.com/reprints.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

© The Author(s) 2026